

Potential large wood-related hazards at bridges: the Czarny Dunajec River (Poland)

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Besides high water levels in the drainage network and important channel changes, the transport of large quantities of wood material must be considered an additional factor of flood hazard in forested areas. At critical sections such as bridges, the effect of the transport and deposition of large quantities of wood during floods is mainly a reduction of the cross-sectional area, triggering a quick succession of backwater effects with inundation of the adjacent valley floor, bed aggradation, channel avulsion and local scouring processes that ultimately may cause embankment/bridge collapse and bank erosion. Therefore, the aim of this work is to analyse potential hazards related to wood transport and deposition in the reach of the Czarny Dunajec (Tatra Mountains foreland, Polish Carpathians) where the river flows through the village of Długopole. Buildings in the village are located very close to the river and the bridge has a very narrow cross-section and is thus threatened by wood-related phenomena. The approach is based on the combination of numerical modelling and field observations. A numerical model which simulates the transport of large wood together with flow dynamics is applied and inlet and boundary conditions are designed based on field observations. We established several scenarios for flow conditions and the wood transport. Results provided data to compute bridge clogging probability under the designed scenarios and the potential impacts of the clogging on hydrodynamics, flooded area and effects on the bridge. This information will be very useful for flood risk assessment and management of the river.

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